ELECTRIFICATION STUDY

Workshop Summary Report
Stakeholder Workshop #4

December 1, 2010

Prepared for:
Metrolinx
20 Bay Street, Suite 901
Toronto, Ontario M5J 2N8

Prepared by:
Delcan+Arup JV
In association with:
Lura Consulting

This workshop summary report was prepared by Lura Consulting. Lura is providing third party facilitation services as part of the GO Transit Electrification Study. This summary report captures the key discussion points raised during Stakeholder Workshop #4. It is not intended as a verbatim transcript of comments received. If you have any questions or comments regarding the summary, please contact:

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1 About Stakeholder Workshop #4

1.1 GO Transit Electrification Study

Metrolinx has initiated a study of the electrification of the entire GO Transit rail system as a future alternative to diesel trains now in service, as well as for the future Air Rail Link (ARL) between Union Station and Lester B. Pearson International Airport. The study is examining how GO and the ARL rail services will be powered in the future – using electricity, enhanced diesel technology or other means.

Over the past 20 years there have been many previous electrification studies but this is the first time that electrification of the entire GO rail system – all seven corridors – has ever been studied. The study is using an expanded and enhanced GO rail network from the network of today as the basis of comparison; this "reference case" network presumes that additional tracks and some of GO's proposed line extensions (to St. Catharines, Kitchener, Barrie Waterfront, Bloomington Road, and Bowmanville) will be constructed in the coming years, resulting in increased train volumes.

1.2 Stakeholder Workshop #4

On Wednesday, December 1, 2010 the Electrification Study Team hosted the fourth stakeholder workshop for organizations across the Greater Toronto and Hamilton Area (GTHA). The workshop – the final in a series of four stakeholder workshops planned as part of the study – took place between 6:30 – 9:00 p.m. at Metro Central YMCA in downtown Toronto.

1.2.1 Purpose

The purpose of the workshop was to provide participants with an update on the Electrification Study progress and to obtain feedback on the key preliminary findings from the Study Team's detailed assessment of network options.

1.2.2 Attendance

In total, 19 stakeholders registered for the workshop, with 15 attending the December 1st session. Two were new participants in the study workshop series. A list of organizations invited to participate in the workshop, as well as those who attended the meeting, is included in Appendix E.

1.2.3 Format

The workshop was facilitated by Mr. Jim Faught of Lura Consulting. At 6:30 p.m., Mr. Faught welcomed the participants to the workshop, described the session's purpose, and introduced the key representatives from Metrolinx and the Delcan+Aurp JV Study Team.

The workshop began with opening remarks from Ms. Leslie Woo, Vice President of Policy and Planning at Metrolinx. Ms. Woo thanked the stakeholders who have been attending the series of workshops for their contributions to the study.

Following the opening remarks, Ms. Karen Pitre, Study Project Director, Metrolinx, presented a study overview and recap of progress to date. Ms. Pitre thanked the stakeholders for their feedback at the stakeholder workshops and though comments online via the Electrification Study website. Ms. Pitre also provided a brief overview of the high-level evaluation of alternative technology and network options.

Next, Mr. Roger Wood, Study Project Manager, Delcan+Arup JV Study Team, presented the methodology used and preliminary fey findings from the multiple category evaluation undertaken of the six "short-listed" and reference case. Mr. Wood provided a detailed summary of the methodology and key findings for the following categories: environment and health; quality of life and user benefits; social and community considerations; and economic and financial considerations. The detailed analysis on environment and health included findings on greenhouse gases (GHG), air quality (both regional and local), electromagnetic fields, and noise and vibration. For quality of life and social/community considerations, Mr. Wood touched on findings related to journey time savings, visual impacts and nuisance effects. Next, economic and financial considerations were presented, including the capital cost methodology and estimated requirements for rolling stock, operating & maintenance, and infrastructure. The presentation was concluded with responses to frequently asked questions from stakeholders and next steps in the study.

The presentation was supplemented with PowerPoint slides that can be found in Appendix A. The workshop format was originally conceived as having a formal presentation component followed by a question and answer period and an interactive breakout session to gather further feedback. However, as the presentation progressed, workshop participants emphasized that they preferred to have their specific questions and comments addressed during the presentation. As a result, an open dialogue between workshop participants and Study Team members continued in plenary for the balance of the workshop. The comments, questions and answers raised and discussed throughout the workshop were captured and have been summarized in the following section. A detailed account of the questions and comments can be found in Appendix B.

During and after the event, stakeholders were encouraged to provide feedback through worksheets provided to all participants (see Appendix C for a sample worksheet). An electronic copy of the worksheet was distributed to the stakeholders following the workshop for those who did not have enough time to complete them during the session. The individual worksheets submitted by stakeholders at or following the workshop can be found in Appendix D.

2 Summary of Comments Received

The following section provides a summary of the questions and comments received from workshop participants. A more detailed account of the questions and comments – along with answers from the Study Team (where provided) – can be found in Appendix B. In addition,

written comments received during and following the workshop via submitted worksheets can be found in Appendix D.

2.1 ARL

- The ARL should be considered as a separate line item in the analysis of network and technology options.
- The Study Team is overstating the length of time needed to electrify the ARL.
- How many locomotives are assumed by the Study Team to be purchased for the ARL? Does the total number of locomotives include spares?
- The Study Team should consider the risk of whether Tier 4 locomotives will be available in time for the PAN AM Games. New technology usually takes longer than anticipated to procure, build, and test.
- What is the cost of converting the ARL from diesel to electric? Is this cost included in the recent procurement contract?
- Who made the decision that the ARL could not be electrified by 2015?
- Political obstructions are preventing the ARL from being electrified right away. The ARL should be the starting point for a phased approach to electrify the Georgetown corridor.
- When will ARL construction begin?
- The cost to electrify the ARL would be substantially less if GO were to purchase EMUs first rather than convert DMUs to electric. This should be noted in the study costing analysis.
- Metrolinx should not rush to complete the ARL by 2015. The Province should pay the extra money and take the extra time to electrify the ARL.

2.2 Tier 4

- Tier 4 technology should not be the starting point for the reference case if the costs are currently unknown.
- Metrolinx should electrify the network now, rather than spend money on purchasing Tier 4 locomotives.
- Will the study integrate the costs of converting existing locomotives to meet Tier 4 emission standards as part of the cost to get to the reference case? How will those costs be adequately and fairly compared to the costs associated with electrifying the GO network?

2.3 Union Station

- The Study Team is overstating the constraints at Union Station. The speed at which a train operates has nothing to do with headway coming into and out of Union Station.

2.4 Air Quality, Health, and Community Impacts

- The study should determine the level of particulate matter in communities adjacent to the rail corridor.
- Regardless of the state of the science, the Study Team should use latest health research to determine best practices for assessing the impacts of ultra-fine and fine particulate matter on local communities.
- Has the Study Team conducted a cost-benefit analysis for health care costs attributed to emissions resulting from diesel operations?
- What are the total amounts of particulate matter and NO_x that will be emitted by the diesel locomotives?
- The Study Team should consult and include health authorities as part of the health component of this study.
- The Electrification Study has not adequately assessed neighbourhood quality of life and community impacts.
- Are there days in the year when GO's diesel operations could push air quality levels over the established emissions thresholds and contribute to an increase the amount of smog days in the region?

2.5 Noise Impacts

- Part of the noise that is generated from train consists comes from wheel noise of passing 12-car coaches as well as breaking. The Study Team's assessment only looked at manufacturing specifications for noise produced by locomotive engines.
- Will noise walls still be needed along the Georgetown Corridor if the corridor is electrified?
- The Study Team is grossly underestimating the levels of noise coming from the GO trains. The Study Team should conduct a more comprehensive noise impact analysis rather than relying on train manufacturing specifications.

2.6 Capital and Operations/Maintenance Costs

- The Study Team should not include costs to electrify CP tracks in their analysis of capital costs.
- Construction along the Georgetown corridor is already protecting for electrification. As a result, the Study Team should not include bridge reconstruction and grounding costs in their assessment of electrification costs.
- The price of diesel used in the study costing methodology is too low. Previous electrification studies conducted by GO have assumed higher diesel fuel prices than what is used in this study.
- The Study Team should do further research on what GO might actually have to pay for electricity if they electrified the entire GO rail network.

- Energy security should be considered as a factor in the Electrification Study. Ontario produces an abundance of hydroelectricity. In the long term, it will be cheaper to purchase electricity than continue to purchase diesel fuel.
- An electrified network presents an opportunity to realize further energy/cost savings and greater price flexibility through energy sharing and co-generation.
- Has the Study Team evaluated the economic benefits and potential land use changes that would result around stations if the GO network is electrified? The Study should consider the benefits that EMUs would offer if additional GO stations are added to the network.
- The Study Team is overstating the size of the fleet needed to provide an electric service. Increased train speed resulting from electrification will reduce trip times and enable a smaller fleet to provide the same levels of service. This will substantially reduce locomotive, operations, maintenance, and service costs for an electrified network.

2.7 Implementation

- A parallel study should have been done that focused on the detailed design of an electrified network.
- Will the study come up with various implementation strategies for electrification?
- The results of the study skew the need to electrify the Georgetown Line first. Previous Metrolinx studies and the Electrification Study all show Georgetown and Lakeshore have similar service levels, but with the addition of running the ARL through the community the benefits of electrifying Georgetown are much higher than those for Lakeshore.

2.8 General Comments

- It is evident that our priority should be to get cars off the road. Electrifying GO trains will not accomplish this.
- The consulting team has done a good job to this date and has outlined achievable strategies. In the end, the decision to electrify is political but the information you are presenting appears in favour of electrification.
- When will the final study report be made available to the public on the website?
- Metrolinx should be more transparent and share service plans with stakeholders so they can understand the context for and findings of the Electrification Study
- Will this study make a definitive conclusion/recommendation on whether to electrify the GO network?

3 Next Steps

The next steps for the study, as presented by Mr. Roger Wood of the Delcan+Arup JV Study Team and Ms. Karen Pitre of Metrolinx, include:

- Completion of the final Electrification Study report;
- Completion of a Metrolinx staff report that addresses the findings and conclusions of the Electrification Study and integrates them into the organization's planning framework;
- Posting of the Final Electrification Study report to the Study website; and
- Presentation of the staff report and final Electrification Study report to the Board of Metrolinx in early 2011.

Mr. Faught thanked participants for their participation and feedback at the workshop. He also noted the opportunity for additional comments to be submitted to the Electrification Study Team via the workshop worksheets, study email address or online on the Electrification Study website.

APPENDIX A: Workshop PowerPoint Presentation

Electrification of the GO Transit Rail Network

Stakeholder Workshop #4
Detailed Assessment

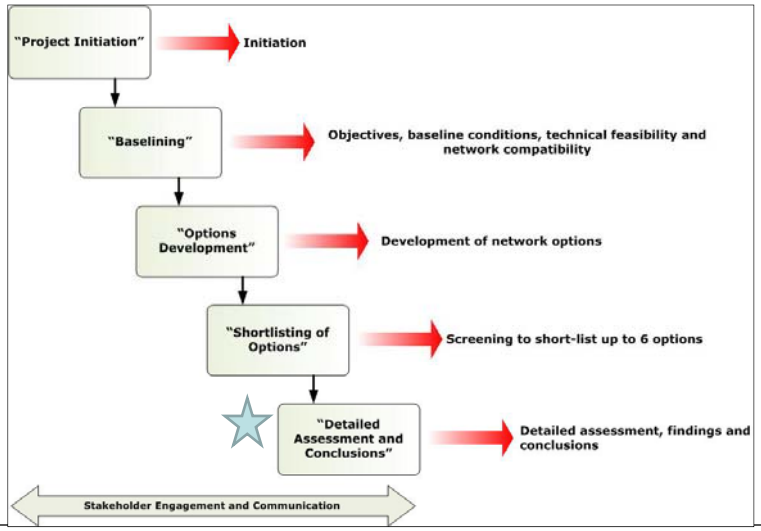
Preliminary Key Findings

December 1st 2010

PRESENTATION OVERVIEW

1. Study Overview & Where We Are
2. Recap: The Reference Case and Getting to the 6 Options
3. Description of 6 Options
4. Key Findings of Multiple Category Evaluation
5. Answers to Frequently Asked Questions
6. Next Steps

Study Overview & Where We Are



Objectives

Criteria

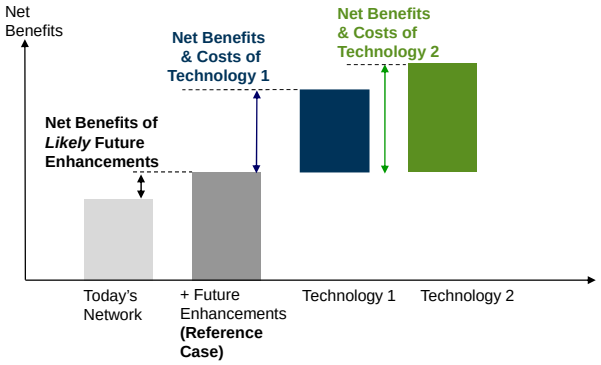
Screening

Study Approach and Objectives

- Study Approach
  - Objective
  - Comprehensive
  - Inclusive
  - Evidence Based
- Study Objectives
  - Technology, Capacity and Transit Service Impacts
  - Environment and Health
  - Community and Land Use
  - Economic
  - System Costs, Funding, Financing and Delivery

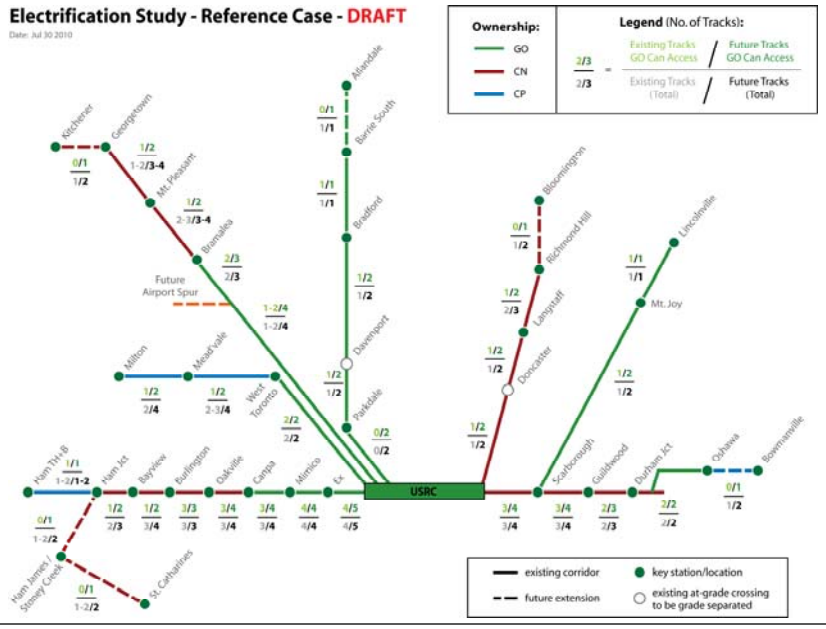
Reference Case

- Basis for comparison of options
- Evaluate the incremental impacts of each technology



Reference Case – Rolling Stock

- MP40 Loco (Tier 4), 10 bi-level coaches



Reference Case - Service Level

Time of Day	Direction	Reference Case
Peak Period	Peak	More trains per hour
Peak Period	Counter-peak	Adds Hourly Service*
Off-Peak Period	Both	Adds Hourly Service*

* Adds half-hourly on Lakeshore Line

Union Station Capacity Study Preliminary Finding:
Union Station, with track modifications, can accommodate the service levels in the Reference Case

Technology Alternatives
Rolling Stock

Hybrid Drive Loco

Dual Mode Loco

Maglev

CNG-Fuelled Loco

Electric Multiple Unit

Electric Loco

Diesel Loco

Electric Multiple Unit

Rolling Stock Technology Alternatives
Shortlist

Diesel Loco

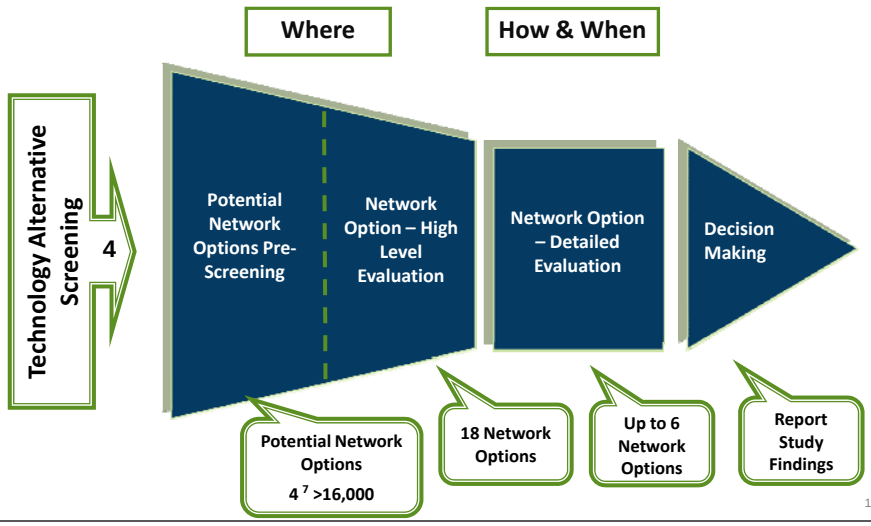
Electric Loco

Dual Mode Loco

Electric Multiple Unit

Power Supply – OPA confirms sufficient power available in the grid

Option Progression



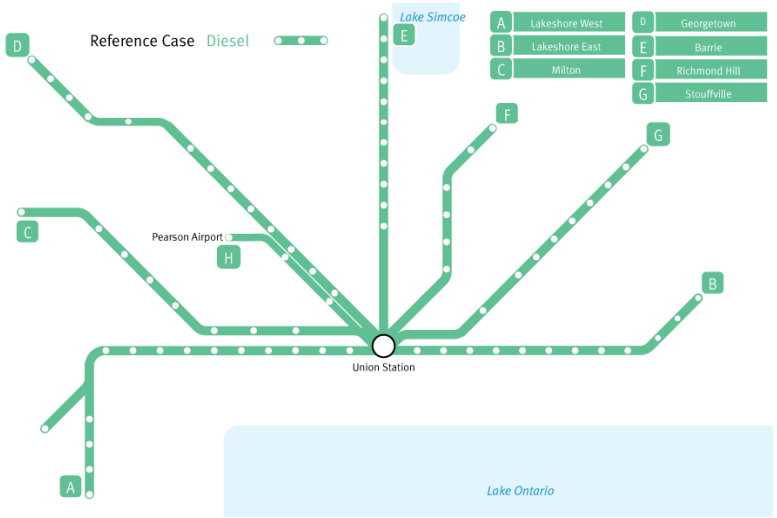
Preliminary Pre-Screening Criteria for Generating Network Options

1. Electric Locomotive, Multiple Unit, and Dual Mode Loco are considered the same family of technologies
2. Lakeshore East and West to operate the same technology
3. Highest service/demand corridors

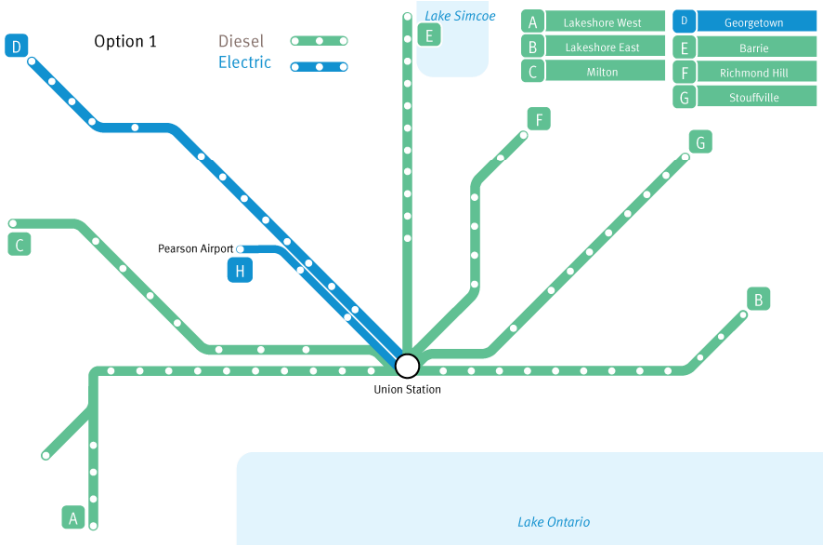
High Level Evaluation of Electrification Options

- Findings:
  - Electric Locomotive pulling 10 coaches most cost effective electric train to use for the comparison to the diesel option
  - Most value for money from electrifying entire corridor (except LW Ham) as final state
  - ARL: single level DMU conversion to single level EMU
  - 6 network options taken forward to compare with diesel option

Reference Case



Georgetown & ARL

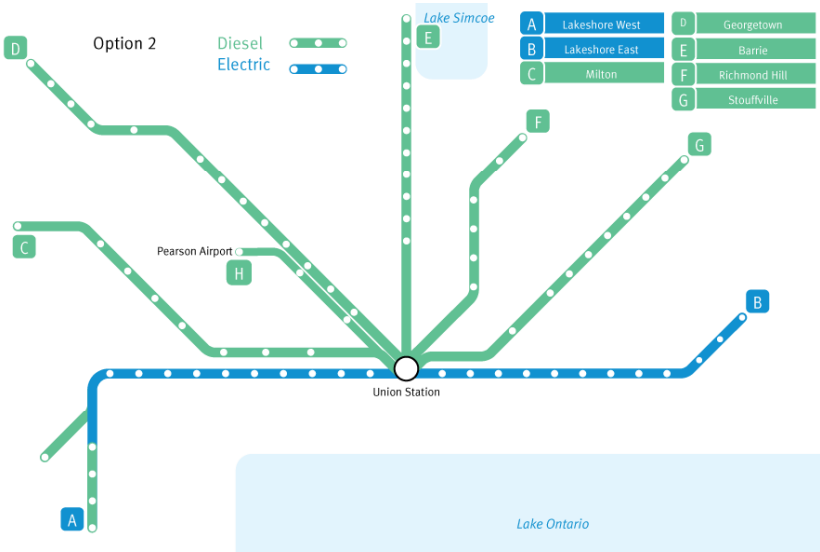


Georgetown & ARL - Key Stats

Item	Option 1
GO Network Length	316.2 mi. 508.9 km
Electrified Length	64.6 mi. 104.0 km
Traction Power Substation	2
Switching Stations	2
Autotransformer Stations	3
Bridges Replaced	0
Bridges Reworked	8
Total Bridges	8
Locomotives	
Electric	17
Diesel	91

Plus 12 EMU's on the ARL

Lakeshore

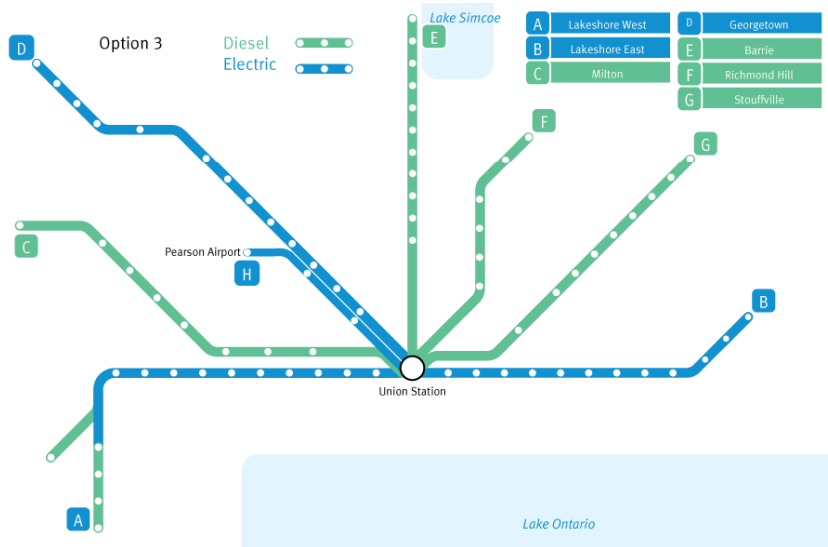


Lakeshore - Key Stats

Item	Option 2
GO Network Length	316.2 mi. 508.9 km
Electrified Length	82.3 mi. 132.4 km
Traction Power Substation	4
Switching Stations	3
Autotransformer Stations	1
Bridges Replaced	4
Bridges Reworked	17
Total Bridges	21
Locomotives	
Electric	34
Diesel	74

Plus 12 DMU's on the ARL

Georgetown & Lakeshore

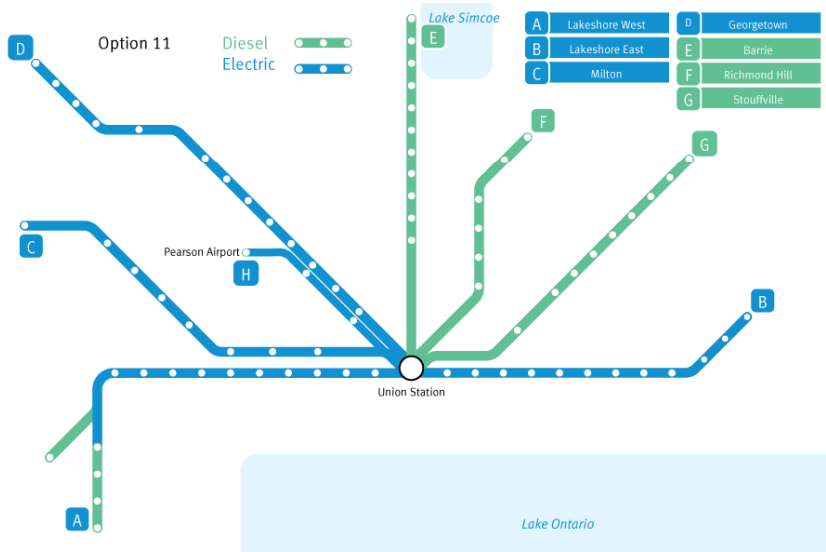


Georgetown & Lakeshore - Key Stats

Item	Option 3
GO Network Length	316.2 mi. 508.9 km
Electrified Length	147.7 mi. 237.7 km
Traction Power Substation	6
Switching Stations	4
Autotransformer Stations	4
Bridges Replaced	4
Bridges Reworked	25
Total Bridges	29
Locomotives	
Electric	50
Diesel	57

Plus 12 EMU's on the ARL

Georgetown, Lakeshore & Milton

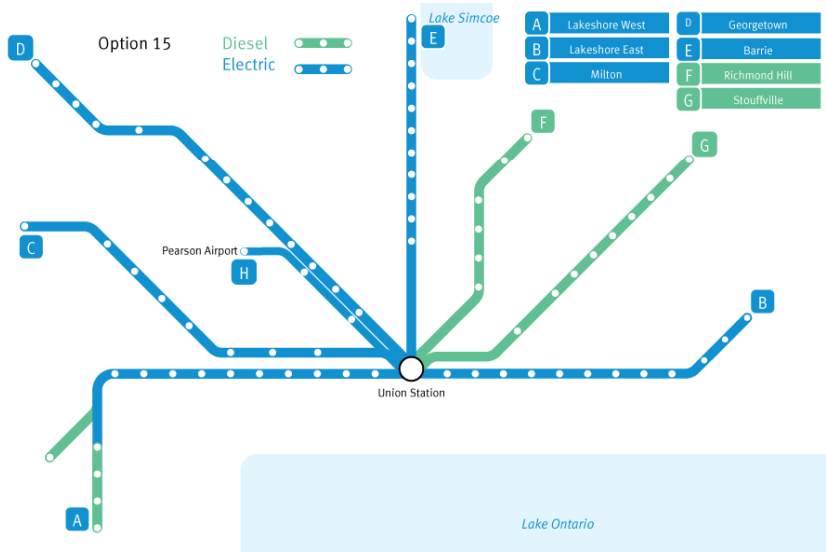


Georgetown, Lakeshore & Milton Key Stats

Item	Option 11
GO Network Length	316.2 mi. 508.9 km
Electrified Length	172.1 mi. 277.0 km
Traction Power Substation	6
Switching Stations	4
Autotransformer Stations	7
Bridges Replaced	4
Bridges Reworked	25
Total Bridges	29
Locomotives	
Electric	63
Diesel	45

Plus 12 EMU's on the ARL

Georgetown, Lakeshore, Milton & Barrie

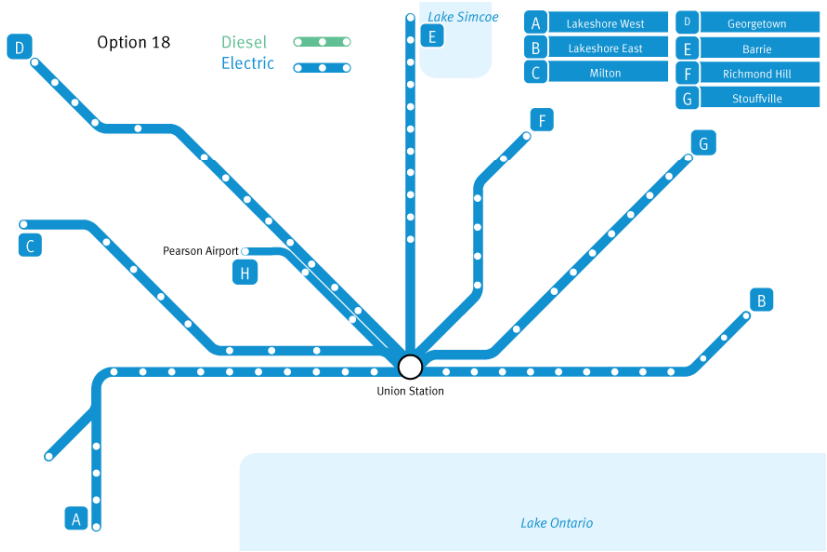


Georgetown, Lakeshore, Milton & Barrie Key Stats

Item	Option 15
GO Network Length	316.2 mi. 508.9 km
Electrified Length	232.1 mi. 373.5 km
Traction Power Substation	7
Switching Stations	4
Autotransformer Stations	10
Bridges Replaced	4
Bridges Reworked	31
Total Bridges	35
Locomotives	
Electric	76
Diesel	32

Plus 12 EMU's on the ARL

Entire Network

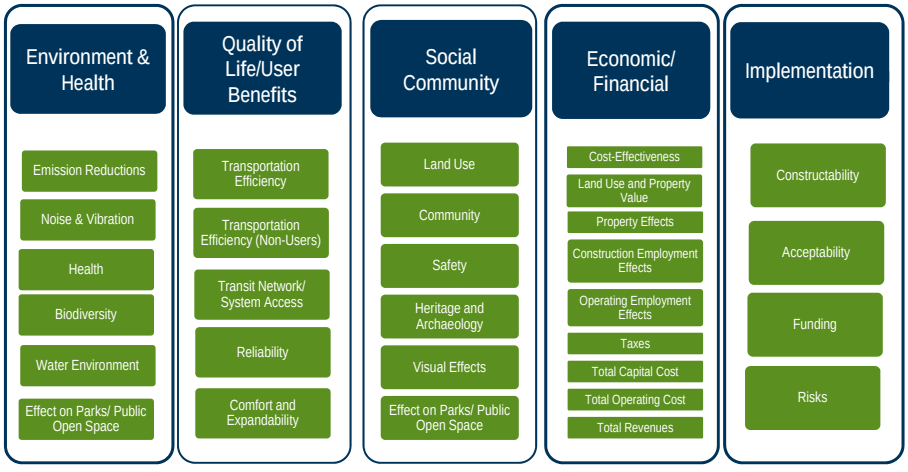


Entire Network - Key Stats

Item	Option 18
GO Network Length	316.2 mi. 508.9 km
Electrified Length	316.2 mi. 508.9 km
Traction Power Substation	7
Switching Stations	4
Autotransformer Stations	17
Bridges Replaced	12
Bridges Reworked	39
Total Bridges	51
Locomotives	
Electric	107
Diesel	0

Plus 12 EMU's on the ARL

Multiple Category Evaluation



Environment and Health

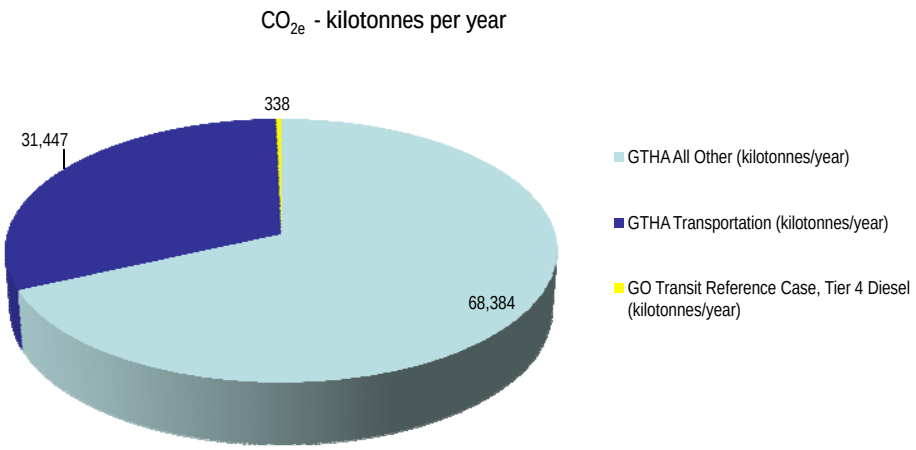
- Greenhouse Gases (GHG)
- Air Quality
  - Regional Air Quality
  - Local Air Quality
- Electromagnetic Fields
- Noise and Vibration

Environment and Health

Green House Gas (GHG) Emissions

- Diesel powered locomotives emit GHG emissions
- Electric Locomotives will also generate GHG emissions from power source
  - Ontario's electricity generation mix by 2025:
    7% thermal, 93% nuclear/renewable [OPA, 2005]

Green House Gas Emissions in the GTHA



Green House Gas Emissions Comparison

GTHA Total Emissions (tonnes/year) (based on 2007)	99,830,245

Option	Emissions from GO Trains (tonnes/year)	(% of GTHA Total)
Reference Case (Tier 4; no electrification)	339,423	0.34%
Georgetown	289,508	0.29%
Lakeshore	199,660	0.20%
Georgetown & Lakeshore	150,744	0.15%
Georgetown, Lakeshore & Milton	120,795	0.12%
Georgetown, Lakeshore, Milton & Barrie	74,873	0.08%
Entire Network	18,968	0.02%

Green House Gas Emissions Reductions from Reference Case due to Increased Ridership

Option	Auto Trips Removed (AM Peak Period)	Auto Trips Removed (Annual)	GHG Reduction (tonnes per year)	GHG Reduction (%)
Georgetown	400	320,000	1,700	0.002%
Lakeshore	900	710,000	5,400	0.005%
Georgetown & Lakeshore	1,300	1,030,000	7,100	0.007%
Georgetown, Lakeshore & Milton	1,600	1,260,000	8,400	0.008%
Georgetown, Lakeshore, Milton & Barrie	1,800	1,420,000	9,800	0.010%
Entire Network	2,000	1,580,000	11,100	0.011%

Environment and Health

Green House Gas (GHG) Emissions

- FINDING: The reference case contributes approx:
  - 339,000 CO_{2E} emissions per year, or
  - 0.34% of the total GHG emissions in the GTHA
- FINDING: Fully electrified system contributes approx:
  - 19,000 CO_{2E} emissions per year, or
  - 0.02% of the total GHG emissions in the GTHA
- FINDING: Fully electrified system reduces the total CO_{2E} emissions in the GTHA by approx:
  - 320,000 per year, or
  - 0.32%

Environment and Health

Regional Air Quality

- The most relevant pollutants with respect to regional smog are:
  - oxides of nitrogen (NO_x)
  - sulphur dioxide (SO_x)
  - fine particulate matter ($PM_{2.5}$)
  - hydrocarbons

Environment and Health

Regional Air Quality

- FINDING: Electrification reduces emissions
- FINDING: All options, including the Reference Case, emit a fraction of 1% of the GTHA's overall regional emissions

Pollutant	GTHA Total Emissions (tonnes/year)	Reference Case (% of GTHA Total)	Full Electrification (% of GTHA Total)
NO_x	239,291	0.2200%	0.0230%
CO	1,289,797	0.0460%	0.0011%
SO_2	218,154	0.0013%	0.0003%
HC	2,207,246	0.0030%	0.0001%
$PM_{2.5}$	1,855,235	0.0006%	0.0001%

- GTHA totals based on Ontario's 2007 total from National Pollutant Release Inventory (NPRI), produced by Environment Canada scaled by population

Environment and Health

Local Air Quality

Methodology

- Defined a study area adjacent to corridor
- Width of study area depends on:
  - GO train and ARL traffic volumes
  - Rural versus urban land-use
- Study area used to determine the potential impact on the local community
- Considered the size of population and number of sensitive locations
  - Sensitive locations - schools, hospitals, daycares, parks, etc.

Environment and Health

Local Air Quality

Methodology (continued)

- Background air quality conditions were determined by reviewing historical air pollutant monitoring from stations throughout the GTHA
  - Downtown air sampling stations
  - West Toronto Diamond air sampling station
  - Average of all air sampling stations across the GTHA
- Considered the particulate emission data for:
  - Tier 4 diesel-electric locomotive and ARL diesel multiple unit
  - Electric locomotives and ARL electric multiple unit
- Reference Case service levels established trains per hour/per day and annually

Environment and Health

Local Air Quality
Methodology (continued)

Emissions from diesel engines:

- Criteria Air Contaminants (CAC's)
- Particulate Matter (PM)
- Volatile Organic Compounds (VOC's)
- Polycyclic Aromatic Hydrocarbons (PAH's)
- Heavy metals

Environment and Health

Local Air Quality
Methodology (continued)

- CO
- NO_x
- SO_x
- PM_{10}
- $PM_{2.5}$
- Formaldehyde
- Acetaldehyde
- 1,3-Butadiene
- Benzene
- Acrolein
- B[a]p
- Metals

GO/ MOE Consultation

Focus

- NO_x
- SO_x
- $PM_{2.5}$

SO_x (SO_2) contributions from GO + ARL found to be very small upon consideration of ultra-low sulphur diesel

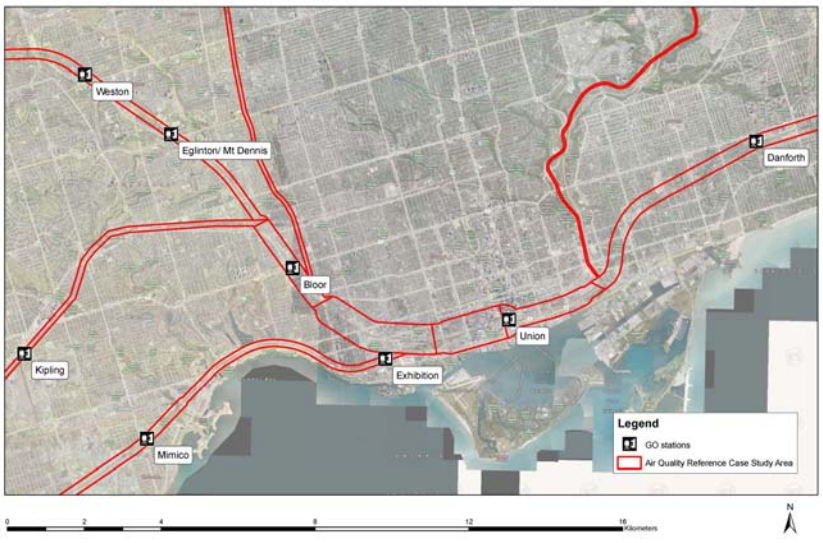
Environment and Health

Local Air Quality

Methodology (continued)

- Computer dispersion modelling used to determine the contribution from diesel trains in the Reference Case
- For each option, looked at the change due to electrification
- These emissions plotted as a function of distance from the corridor
- Compared these emissions to the background
- These emissions are considered measurable if greater than 10% of background

Air Quality Study Area (Reference Case)



Environment and Health

Health – Guidelines to Assess Air Quality Impact:

- World Health Organization (WHO)
  - Air Quality Guidelines (AQG) updated in 2005
  - AQG designed to offer guidance for reducing the health impacts of air pollution
  - Updated AQG based on extensive body of scientific evidence relating to air pollution and its health consequences
  - AQG are based on:
    - sensitive indicators (such as physiological measures – e.g. changes in lung function, inflammation markers)
    - most critical population health indicators such as mortality and unscheduled hospitalizations
- Ontario Ministry of the Environment (MOE)
  - has Ambient Air Quality Criteria (AAQC's) for Ontario - effects-based levels in air, based on health and/or other effects, and used to assess potential for adverse effects

Environment and Health

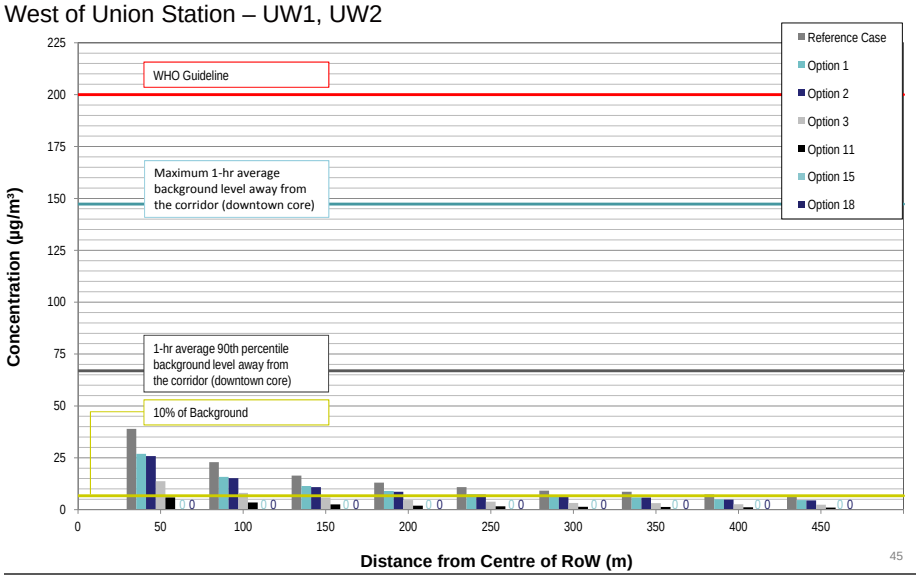
Comparison of Air Quality Guideline Values

Pollutant	Averaging Time	WHO AQG (ug/m^3)	MOE AAQC (ug/m^3)
$PM_{2.5}$	1 year	10	n/a
	24 h	25 (99th percentile)	50 (98th percentile)*
PM_{10}	1 year	20	n/a
	24 h	50 (99th percentile)	50
Ozone, O_3	8 h, daily max	100	n/a
	1 h		165
NO_2	1 year	40	n/a
	24 h	n/a	200
	1 h	200	400
SO_2	24 h	20	275
	10 min	500	n/a
	1 h		690
	annual		55

* Canada-Wide Standard

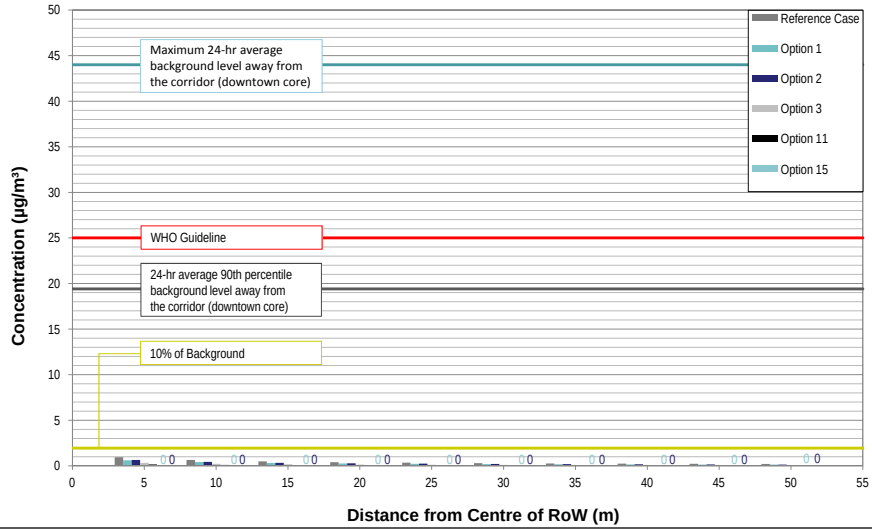
1-hr Average NO_2

West of Union Station – UW1, UW2



24-hr Average $PM_{2.5}$

West of Union Station – UW1, UW2



Environment and Health

Local Air Quality

- FINDING: Contribution of NO_X, $PM_{2.5}$, and other contaminants from the Reference Case number of trains (Tier 4 Diesel) is very small compared to background levels and WHO guidelines
- FINDING: The background monitors in the GTHA for the 1-hr and 24-hr NO2 levels never exceed the WHO guideline or MOE AAQC's
- FINDING: For $PM_{2.5}$, the 90 percentile background level is below the WHO guideline at GTA monitoring stations
  - but the background level does exceed the guideline level ~ 4% of the time, and exceeds the CWS level 1 day/year [MOE, Air Quality in Ontario Report, 2008]

Environment and Health

Local Air Quality

- FINDING: Ultra Fine Particulate Matter – the air quality thresholds have not been established by the WHO
- FINDING: For 24-hr SO_2, the 90^{th} percentile background level is below the WHO guideline
  - but the background level does occasionally exceed the guideline. It never exceeds the MOE's AAQC [MOE, Air Quality in Ontario Report, 2008]

Environment and Health

Electromagnetic Fields (EMF)

- Consultants investigated the potential impact of electromagnetic fields (EMF)
- Numerous epidemiological studies on the topic have been conducted
- EMF measurements of electric and magnetic fields along an electrified railroad showed readings below the American Conference of Industrial Hygienists (ACGIH) and Institute of Electrical and Electronic Engineers (IEEE) limits
  - DOT/FRA/RDV-06/01, EMF Monitoring on Amtrak's Northeast Corridor: Post-Electrification Measurements and Analysis, October 2006
- FINDING: No consensus on the relationship between magnetic fields from an electrified rail corridor and health issues
- References:
  - National Cancer Institute (NCI) website www.cancer.gov
  - World Health Organization (WHO) website www.who.int

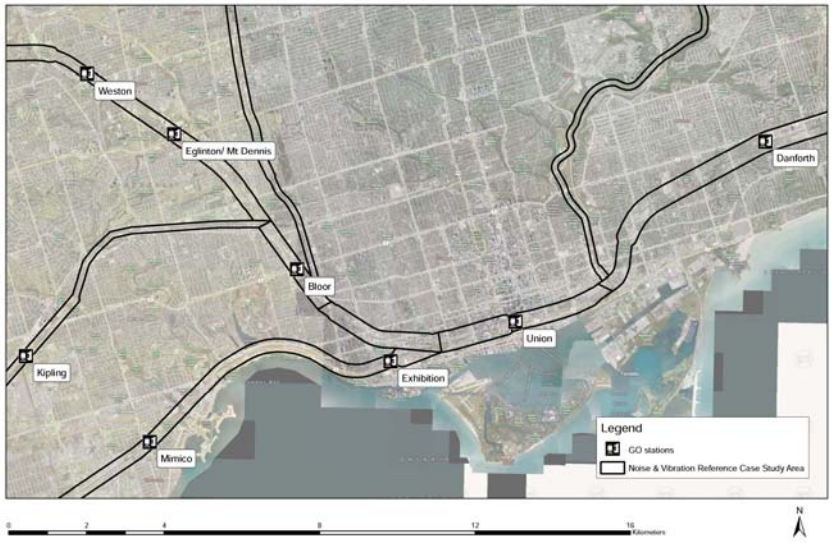
Environment and Health

Noise and Vibration

Methodology

- Determine noise levels for each technology immediately adjacent to the corridor:
  - 82 decibels for bi-level EMU
  - 86 decibels for electric loco
  - 89 decibels for diesel loco
  - 82 decibels for ARL EMU
- Background defined for both daytime and nighttime periods:
  - Assumed daytime urban background noise level 55db
  - Assumed nighttime urban background noise level 50db
- Noise levels decrease as one moves further away from the rail corridor
- Noise level changes are discernible to the human ear at about 5db or greater
- The study area :
  - Defined by modeling
  - Defined as the area where the train noise would be heard
  - Based on max speed along that section

Noise & Vibration Study Area (Reference Case)



Environment and Health

Noise and Vibration

- FINDING: The difference between diesel and electric loco's is 3 dB (89 vs. 86 dB), which would be barely perceptible by an average human
- FINDING: The difference between the diesel locomotive and 12 car EMU's is 7 dB (89 vs. 82 dB), which is perceptively quieter

User Benefits / Quality of Life

Journey Time Savings

- An operating plan was developed using the Reference Case service levels
- Based on this scenario an estimate of journey times was modelled using the different locomotives
- Modelling was done to estimate the impact on auto users and estimate the increased ridership due to the time savings

Journey Time Savings Over Reference Case (min)				
Route	**Train Type**	**Service**	**Electric Loco-Hauled Cars**	**EMU Train**
			Electric Loco + 10 Bi-level Cars	6 Bi-level Powered Cars + 6 Bi-level Unpowered Cars
LW: Hamilton – Union	Local	Inbound	7	17
	Local	Outbound	6	16
LE: Bowmanville – Union	Local	Inbound	6	16
	Local	Outbound	8	18
MT: Milton – Union	Local	Inbound	3	9
	Local	Outbound	4	9
GT: Kitchener – Union	Local	Inbound	7	14
	Local	Outbound	11	18
BA: Allandale – Union	Local	Inbound	4	12
	Local	Outbound	6	14
RH: Bloomington – Union	Local	Inbound	0	4
	Local	Outbound	1	5
ST: Lincolnville - Union	Local	Inbound	1	6
	Local	Outbound	3	8

User Benefits / Quality of Life

Journey Time Savings

- FINDING: There is approximately a 5% increase in ridership (depending on the option) due to transit time savings and these additional riders generate additional revenue
- FINDING: Electric locomotives produce journey time savings of approximately 7-9% On the ARL, Barrie, Richmond Hill, Stouffville this is less - around 3%-5%
- FINDING: EMU's produce additional journey time savings compared with the diesel locomotives
- FINDING: Maximum benefits of electric locomotives cannot be achieved with existing speed limits and the bottlenecks getting into and out of Union Station

User Benefits / Quality of Life

Social and Community

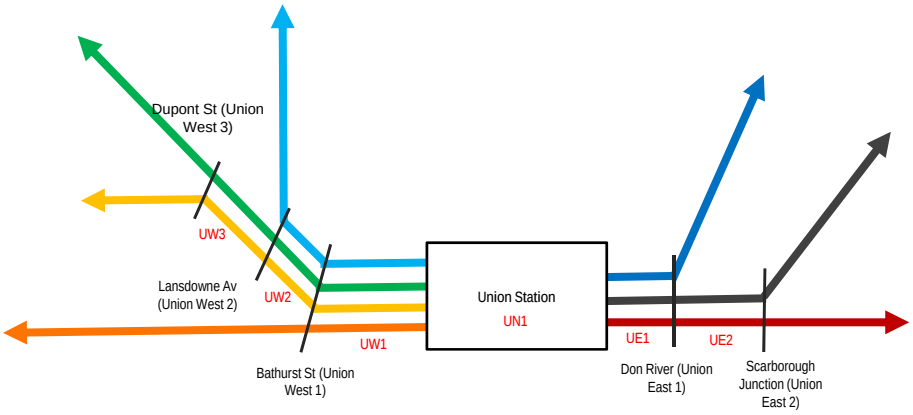
- This is a qualitative assessment
- Includes impact on safety, visual impacts, and nuisance effects
  - FINDING: Electrified systems have safety issues due to the power supply but these can be mitigated by appropriate signage, protection and education
  - FINDING: Construction of overhead catenary system, substations and autotransformers has a negative visual impact; this would be addressed in an Environmental Assessment
  - FINDING: No significant difference in nuisance effects (noise, odour and dust)

Capital Cost Estimating Methodology

- Cost elements consistent with Benefits Case Analysis (BCA) framework
- Benchmarking against current practices
- Costs compiled by sections
  - 25 corridor sections
  - 37 cost sections: to account for varying numbers of tracks

Corridor Sections

Downtown Toronto Detailed Sections



Infrastructure Capital Cost Elements

- Systems
  - Traction power supply
  - Traction power distribution (overhead catenary system , cross bonding, support)
  - Maintenance and layover facilities, maintenance vehicles
- Track and track elements
  - Overhead structures rework:
    - Jacking of bridges
    - Undercutting ballast
    - Replacement of bridges
  - Infrastructure rework:
    - Architectural/structural enhancements
    - Modifications of signal bridges
    - Rework at level crossings
    - Signalling modifications, USRC cabling
    - Control center

Infrastructure Capital Cost Elements

- Site work and special conditions
  - Demolition/clearing/earthwork
  - Site utilities, utility relocation
  - Security fencing, retaining walls
  - Temporary facilities
  - Environmental mitigation
  - Bonding/grounding
- Professional services

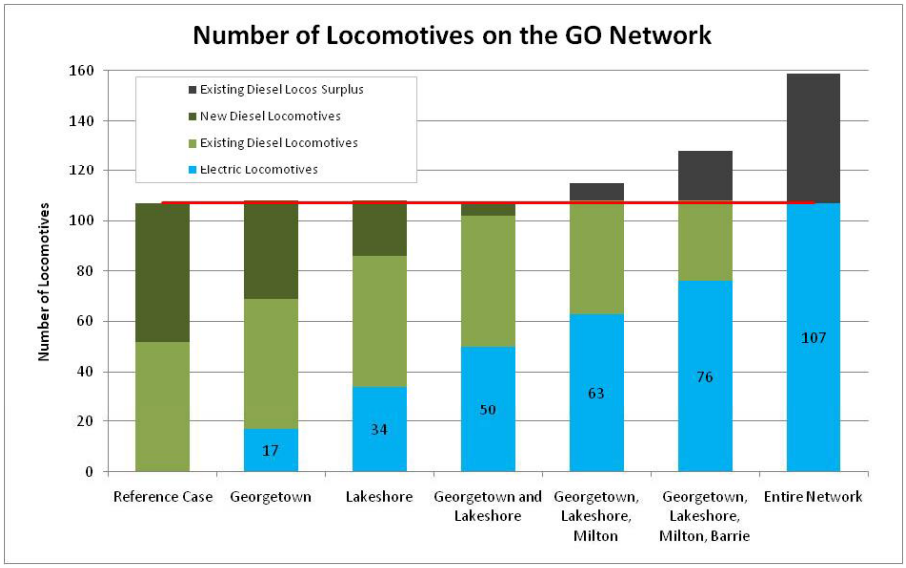
Rolling Stock Capital Costs

- Capital costs for each vehicle type compiled by reviewing the industry for recent sales of comparable equipment
- Considered Metrolinx requirements as compared to the most recently awarded North American procurements
- In some cases, direct comparisons could be found. In others, extrapolations had to be made. Unique vehicle types include:
  - Diesel locomotive (Tier 4 compliant)
  - Electric locomotive
  - Single-level DMU
  - Single-level EMU

Rolling Stock Estimates

- Diesel Locomotive
  - based on GO Transit's purchase of Motive Power Industries (MPI) MP40PH-3C locomotives in 2008, plus an up-charge for Tier 4 compliant engine(s)
- Electric Locomotive
  - based on average of New Jersey Transit's (NJ Transit) purchase of Bombardier ALP-46A locomotives in 2008 and Amtrak's purchase of Siemens ACS64 locomotives in 2010
- DMU (ARL)
  - based on LTK engineering estimates for Denver Regional Transportation District (RTD), NJ Transit, and Sonoma Marin Area Rail Transit (SMART) in 2010
- EMU (ARL)
  - based on LTK engineering estimates and RTD's purchase of single-level EMUs in 2010

Rolling Stock Requirements



Operating & Maintenance Cost

Methodology

- Costs compiled by sections
- Three categories of costs included in the annual Operations and Maintenance estimates:
  - Rolling Stock
  - Wayside (Electrification Infrastructure)
  - Energy Costs
- Assumption that several annual maintenance costs are the same across technologies
  - Track maintenance for corridor infrastructure same regardless of technologies (excluding Overhead Catenary System)
  - Number of staff operating a vehicle is the same regardless of technology
  - Contract administration costs required for the operation of the reference case service is the same regardless of technology

Operating & Maintenance Costs

Rolling Stock

- Defined a comprehensive Life Cycle Maintenance (LCM) program
- The maintenance operation was broken down into the following categories:
  - Daily Maintenance and Inspection
  - Vehicle Cleaning
  - Scheduled Maintenance Program (also called Programmed LCM), which incorporates:
    - Running Repair and Corrective Maintenance
    - Heavy Repair
    - Mid-Life Overhaul
    - Unscheduled Maintenance

Wayside Maintenance

- Overhead catenary
- Power supply equipment (such as sub-stations)

Operating & Maintenance Costs

Energy Costs

- Diesel fuel was assumed to cost $0.75/L, based on current 2010 costs paid by Metrolinx
- Electricity was assumed billed at an average rate of $0.108/kWh, based on the electricity prices on the Hydro One website. No discounts or peak-use premiums were applied.
- Operation model produced total diesel fuel consumption per option
- Energy modeling, based on operating plan, produced total electricity consumption per option

Economic and Financial

- Major Financial Factors include:
  - Incremental rolling stock costs
  - Fuel v. electricity costs
  - Energy cost escalation
  - Capital cost and capital cost contingency
  - O&M cost savings
  - Demand levels
  - Inflation
  - Fare box revenue
- Economic Factors include:
  - Construction employment
  - Operating employment
  - Increased tax revenue

Responses to Frequently Asked Questions

- ARL incorporated throughout analysis?
- Costs of converting to Tier 4 included?
- Incremental costs of rolling stock considered?
- Full consideration of potential for EMUs?

Next Steps

- Completion of financial/ costing analysis; sensitivity analysis
- Completing risk assessment, example risks:
  - Corridor ownership
  - Clearances
- Phasing and implementation plan
  - assuming construction will be completed in shorter time blocks during the night to avoid the disruption in service
- Final report posted for public comments on study website (January)
- Board meeting to consider study findings (February 18)

Video

Discussion Questions for Small Groups

- What feedback do you have on the detailed assessment and key preliminary findings? Has anything been missed?

- In view of the key findings, what are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

APPENDIX B: Question and Answer Discussion Summary

GO Transit Electrification Study Stakeholder Workshop #4
December 1, 2010

Detailed Notes on the Comments, Questions & Answers:

Following welcoming remarks and the Study Team presentation, workshop attendees were given the opportunity to ask questions and provide comments (indicated by a 'Q' and 'C'). Answers, where provided, are indicated by an 'A'.

***Q1a**: On page 3 of the slide deck, reference was made to the rolling stock as Tier 4 locomotives. However, the existing MP4s may only meet Tier 1 emission standards.*

A1a: GO Trains currently adhere to Tier 2 emission standards. Metrolinx has stated that their fleet of locomotives will meet Tier 4 emission standards by 2015. As a result, we are using Tier 4 locomotives as our starting point for the Electrification Study in order to compare the available technology and network options.

***Q2a**: How can the Study Team use Tier 4 locomotives in the reference case if they don't know what the conversion costs will be?*

***A2a**:* GO Transit is planning to implement Tier 4 technology across the network. The purpose of using Tier 4 technology in our reference case is that we want to give Metrolinx enough information to do a thorough comparison of the technology options based on their current plans so that they can make an informed decision.

***Q3a**: Why is ultra fine particulate matter not included on the list of Environment and Health indicators?*

A3a: The Study Team has used air quality guidelines outlined by the World Health Organization. NO_x, SO_x, and $PM_{2.5}$ have been used as they are good indicators for overall air quality, they are easy to measure, and they can often act as indicators for other air contaminants. .

***Q4a:** For clarification, in the tables on slide 33 you referenced a sequence of options (Georgetown, etc). Do those options correspond to the options seen in the graphs on slide 45? There is a big drop between the reference case and Georgetown, and then practically no changes.*

A4a: Yes, the options on slide 33 correspond to those on slide 45. The slides show that if you electrify Lakeshore after Georgetown there is only a slight drop in NO_2 emissions.

***Q5a:** Can you explain what is meant by the tags in the graphs on slide 45 (e.g. Background level away from the corridor)?*

A5a: In order to determine the background air quality levels we looked at different zones adjacent to the rail corridor. The zones do not always overlap as you might expect; the

downtown core would be the worst in terms of air quality, but may not be the area of greatest activity from the GO trains.

Q6a: *Is the background air quality not worse on the corridor than in the downtown core?*

A6a: Not necessarily.

Q7a: *What is the particulate matter 5 meters from the corridor (see slide 46)?*

A7a: This is not shown in the graphs, but the data does exist. The graphs show the readings at distances from the centre of the right-of-way to illustrate a general trend that could be used to compare the options.

Q8a*: In response to Roger's comment that air quality thresholds for ultra fine particulate matter have not been established by the WHO, could the Study Team not go to a school of public health and collaborate with local professors to ascertain appropriate thresholds air quality contaminants?*

A8a: Research on the impacts of ultra fine particulate matter is still preliminary and nothing has not been published or ratified by organization like the WHO. Until this happens, there is no universal threshold that has been recognized as appropriate to use.

Q8b*: So the Study Team is unable to use existing research because it is not a standard? Or, are you unable to determine what the threshold/standard might be?*

A8b: As we mentioned previously, we are using established and recognize air quality guidelines that have published by WHO.

Q9a: *What is the noise level for the ARL as a DMU? Is there a reason why it is not listed?*

A9a: The noise level for the ARL as a DMU should have been included in the presentation. The level of noise is in the range of 86-89 decibels.

Q10a: *What about noise generated by the wheels of a passing 12-car coach? Why has this not been included?*

A10a: The noise on the carriages is consistent for both alternatives in the calculations; the purpose of this exercise is to compare the relative differences of the options.

Q11a: *In terms of the impact of the additional service in the corridor, is there a distinction between the reference case versus electrification?*

A11a: The level of service is consistent, whether it is diesel or electric. This will be discussed further in the presentation.

Q12a: *Have you considered the need for sound walls previously proposed by Metrolinx along the Georgetown corridor? Metrolinx has stated that 20km of 10-foot high walls will be needed to*

mitigate noise impacts of diesel trains on the community. Would there not be a need for the walls if Metrolinx chose to electrify their operations?

A12a: When looking at the noise levels coming from diesel and electric locomotives there is little differentiation between the technologies. As a result, the sound walls will still likely be needed.

***Q13a**: Are you considering re-signalling the corridors? Other parts of the world have experienced increased capacity and journey time savings as a result of re-signalling. Are you considering this in your analysis of the alternatives?*

A13a: The benefits of re-signalling would be applied to both diesel and electric operations. Re-signalling would produce journey time benefits and it would be a viable option if there was infinite capacity at Union Station. However, we are not considering it in our analysis because it would take a significant amount of money to re-signal existing operations. It is important to note that with improvements to Union Station we can accommodate the reference case, but not much more than that.

***Q14a**: Is the ARL not operating on a dedicated track to the airport?*

A14a: We are not privy to all of the ongoing conversations surrounding the ARL and as a result I am not able to speak to that. For the purposes of the Electrification Study we have assumed it will operate on existing track in the Georgetown corridor.

***Q15a:** (In reference to slide 59) To clarify, for UW3, between Lansdowne and DuPont, there are two separate lines at that point in the corridor? Why are they grouped?*

A15a: This is how it was handled in the analysis based on guidance from GO.

***Q16a:** Are you going to electrify the CP tracks? I didn't think Bolton was being electrified.*

A16a: GO Transit operates in a mixed use corridor that accommodates both passenger and freight movement. As a result, should Metrolinx choose to electrify GO operations they will need to electrify all of the tracks along a rail corridor.

***Q17a:** We have been told that the Georgetown corridor is being built to be electrification ready. Are you counting the costs of bridge reconstruction and grounding in your analysis? The infrastructure will be ready prior to electrification than those costs should not be included in your analysis.*

A17a: The bridges that are being rebuilt along the Georgetown corridor will accommodate electrified operations. I do not think that protecting for electrification includes grounding, however, it is accommodating for clearances. The foundations for catenary are not being built, but room has been made to accommodate them in the future.

***Q18a:** Has anyone found out whether there are grounding issues at the airport?*

A18a: We have had conversations with the airport and have not been made aware that are any grounding issues at the airport. Around the world, there are many electrified train services that go into airports.

Q19a: *Is the ARL being examined as a separate and distinct piece of work?*

A19a: Yes, that is why we divided the corridors as we did.

Q20a: *There is no existing Tier 4 locomotive on the market. There aren't even Tier 3 locomotives on the market. Also, the existing locomotives that will be used are not Tier 4, they are Tier 2. All this should be made clear in your presentation.*

A20a: GO Transit has made a commitment to move to Tier 4 locomotives by 2015. This announcement corresponds with the United States EPA regulation that after 2015 all new locomotives will be required to meet Tier 4 emission standards. Currently, we know that GE is building a Tier 4 locomotive that will be ready for 2013. As a result, we are extremely confident that the technology will be available by 2015.

Q21a: *If Tier 4 locomotives will not be ready until 2013 would it not make sense to electrify GO operations first? China just completed 11 subway lines in 5 years. Why can we not convert GO operations prior to 2015?*

A21a: The design process with electrification could take up to 4 years, so it is not feasible to have it up and running by 2015 for the airport express. The example you provided is in Shanghai. I believe those subways were going in virgin territory without any need for reconstruction. If we are to maintain the commuter service we have here, we need to consider the local conditions. In Toronto, we will not be able to have significant periods of downtime like other jurisdictions.

Q22a: *Isn't most of the right of way wide enough to accommodate local construction? How are you planning to build three new tracks and not interrupt existing service levels? Also, we found studies from the early 90s which said it was one day of work to realign and lower the existing track. Can't you just build the new tracks much lower and electrify? How do we explain how the standards have changed? Due process is ridiculous, why do we need a new EA?*

A22a: Your comments are valid, but not necessarily relevant to electrification. There is due process that has to be considered when undertaking such a significant project. This process makes it likely impossible to electrify by 2015.

Q23a: *Do your fleet estimates include spare locomotives that are needed? How does the ARL fit into those calculations? The press says GO is buying 18 DMUs. Is that cost not part of the study?*

A23a: Metrolinx is buying 6 DMUs for the ARL, four for operations and two spares with an option to purchase 12 additional units if needed. Yes, the costs are part of the overall costs that are outlined in the study.

C24a: *As a point of clarification, the press release from Metrolinx says the procurement contract was to purchase up to 18 DMUs.*

Q25a: *For the people living along the corridor, the majority of trains passing through their community will be for the ARL. It's difficult to understand why you aren't including that in your analysis of service frequency and other factors.*

A25a: The ARL has been included in and accounted for in all parts of the Electrification Study.

Q26a: *If you're ordering vehicles for the ARL, what is the conversion cost and is it part of the existing contract?*

A26a: I can't comment on the contract, but the conversion cost has been taken into consideration in the study and will be clarified in the final report.

Q27a: *In previous electrification reports, they used higher prices for diesel than this study. Prices for oil are set to skyrocket by 2015. The figure you're using is making diesel locomotives a more lucrative option. What do you use as the price of diesel fuel in 2015?*

A27a: It is extremely difficult to speculate what fuel prices may be in the future. The price quoted is how much GO Transit is paying for diesel fuel today.

Q28a: *More debate is needed on the price of energy used in this study. With the loss of the electric bus in the early 90s, more research should have been done on what we will pay for electricity. Electricity will be easier than oil to purchase in the future.*

A28a: We felt it was appropriate to take something that is known at the moment and conduct a sensitivity analysis on that figure to understand the impacts of changing prices to both diesel fuel and electricity. We benchmarked our figures with other sources. The Study Team is looking to understand what the difference is between diesel and electric operations on the GO network.

C29a: *As long as the technology allows you to covert between two energy sources then the costs will keep in step. Electrification gives the advantage of using efficiency measures such as heat shaving and co-generation to reduce energy costs.*

A29a: We've captured your comment in our notes.

Q30a: *As exemplified in the 1970s oil crisis, geopolitical events can affect certain forms of energy more than others. We produce an abundance of hydroelectricity in Ontario which is much more stable that oil.*

A30a: The risk of consistency of supply was captured in our study. Your point is valid and we have taken it into account in the study.

Q31a: *What would happen if Tier 4 locomotives aren't available by 2015? Has the Study Team addressed this risk? What kind of train would you use?*

A31a: The specific knowledge of procurement agreements and strategies are not available to the Study Team. However, in our conversation with GO they are extremely confident that Tier 4 locomotives will be available in 2015. As mentioned previously, the EPA in the United States has passed legislation requiring all new locomotives to comply with Tier 4 emission standards by 2015.

Q32a: *There is a high risk that Tier 4 standards will not be met. Electrification has its own risk and operational constraints as well. If we were to look at studies done in the past and learn from them, wouldn't that be better than hoping that Tier 4 locomotives are available in time? People on corridors will be impacted if train specifications aren't met.*

A32a: As mentioned, GO Transit is fully confident that Tier 4 locomotives will be available by 2015 and be operational along the ARL.

Q33a: *Why has there not been a parallel study for implementation and detailed design to move this process forward sooner?*

A33a: There has not been a decision to electrify. Without an understanding of what option(s) is preferred or if electrification is viable, GO Transit is not in a position to begin developing a design and implementation plan/study for electrification. There is a desire to have an answer and commitment from funding partners before taking that step. Decision makers need reliable, accurate, and up-to-date information to understand what the appropriate decision might be and what should happen next.

Q34a: *The community is unanimously in favour of electrification. If the government cared about communities they would recognize that. Who will be held accountable for wasting all this time and spending public money to complete a study that has told us findings that are self-evident?*

A34a: We need to get to a conclusive set of findings and give people enough information to make an informed decision about electrification.

Q35a: *When was the decision made that the ARL cannot be electrified in time for the PAN AM games?*

A35a: Construction scheduling does not permit the electrification of ARL in time for the PAN AM games. There are number of basic constraints, construction of the power supply is one that is significant. We have had several conversations with Hydro One and they have said that

based on their previous experiences, completing the design, negotiating the contract and construction, the power supply system usually takes about four years to complete.

Q36a: *Why did the Study Team not consider electrifying the ARL first and then take a phased approach to electrify the rest of the network?*

A36a: As a part of the implementation and phasing, by section, one section could be the ARL, but you wouldn't build a substation just for one that leg. It would be part of the decision to electrify the Georgetown corridor.

Q37a: *It seems that political obstructions are preventing GO from electrifying the network. If needed, we could put substations on a tractor trailer. Many other places in the world have done that. We could electrify the ARL in time for the PAN AM Games if the Province really wanted to.*

A37a: The Study Team is not aware of any decisions that have been made and we are unaware of any political obstructions to electrification. Our intention is to move this process forward by completing a comprehensive and objective study for Metrolinx.

Q38a: *When will construction begin on the ARL?*

A38a: Metrolinx has said previously that shovels will be in the ground by 2012.

Q39a: *This is a liberal railroad; it will get shut down politically.*

A39a: I cannot speak to your comment.

Q40a: *How will the cost of converting to Tier 4 be included in the study? Will the final report show how much will be saved in conversion costs if GO chose to electrify the network prior to 2015?*

A40a: The staff report will take into account a series of issues to get to the 'reference case'. The cost for implementing the various options will identified in the final report. The time to electrify the whole network is quite significant. There has been considerable debate on the cost savings of beginning to electrify the network prior to 2015. There is no clear solution on how to deal with it. The reference case was developed to compare technologies. There will have to be a response to the report that makes the comparison at the point in time related to implementation. This report will capture that cost for incremental change from Tier 2 to Tier 4 compared to cost of electric locomotive.

Q41a: *Will the study not come up with various implementation strategies?*

A41a: There is an implementation and a phasing strategy as part of each option.

Q42a: *EMUs are stated as being much more expensive. Currently, GO Transit has approximately 50 coaches. If EMUs were purchased right away then there would not be a need to also purchase new coaches, and as a result EMUs might not be a that much more expensive of an option. What is the cost of the new coach? What's the cost of one EMU?*

A42a: We've been looking at the various costs that would be incurred to electrify the GO network and trying to understand if electrification is in fact a viable option from a costing and other perspectives.

Q43a: *Have you done an analysis on the economic benefit of electric locomotive as it relates to health care cost for addressing air quality contaminants? I am fairly certain that any new project that government undertakes has to go through a health care analysis to understand the projects impact on the health care system. Have you done this analysis?*

A43a: As mentioned previously, we are undertaking a social community and health impact analysis as part of the study. I am not aware of the requirement you mentioned. We showed you the emission levels and air quality impacts of the various options but have not quantified the health impacts.

Q44a: *You suggested that an additional cost to electrify the ARL is the cost of converting the vehicles to EMUs. Will you itemize that cost and present it in your final report? I understand that it is not your decision to purchase DMUs. Can you not at least footnote that it's the decision to purchase diesel trains that has increased the cost of conversion rather than buying electric from the beginning?*

A44a: We've taken into account of the fact that the ARL will need to be converted from diesel to electric. The final report will outline the cost for converting the ARL to EMU and the cost to purchase EMUs from the start.

Q45a: *Is there an approximate time in January when the final report will be posted to the Electrification Study website?*

A45a: Middle of January.

C46a: *There is another option to provide transportation services during the PAN AM Games - a high-quality bus service on dedicated lanes could be used during the two-weeks of the games rather than build the ARL in time for the games. Metrolinx should not rush the project and pay the extra costs to do the project the right way from the beginning.*

Q47a: *Could you e-mail us the worksheet?*

A47a: We will send you an electronic copy to fill out.

C48a: *(In reference to the video presented) In reality that train would be going by in far less time because it would be electric.*

Q49a: *Previous studies that have looked at the potential for electrification. They have not given a definite answer as to whether it is a good option for GO Transit. Will this study provide a definitive answer?*

A49a: The Metrolinx Board has committed to address the findings of this study and provide a recommendation to the Ministry of Transportation. It's up to the Board to make that decision.

Q50a: *What are the actual fleet requirements? In your presentation you mentioned that the fleet size would be the same for both diesel and electric operations. How can Caltrain, who also examined various rolling stock technology options, conclude that EMUs were better if they were looking at a system that is longer in length and has half the consist length? Why are EMUs not suitable for GO operations?*

A50a: We can come to the same conclusion, but it is apples and oranges. The constraint of Union Station doesn't allow the increased number of ins and outs.

Q51a: *The speed at which the train operates has nothing to do with the headway coming into Union Station. If the train can run more quickly, you don't need as many trains coming into Union. You are overstating the size of the fleet needed to provide the electric service. Union has nothing to do with the round trip time. The time needed to cover the outer parts of the system will reduce the fleet requirements and you're not accounting for this. Your problem is having 4 service plans that don't comment on where you hit the wall in various scenarios where constraints fit in. You are mixing and matching numbers that distort the outcome of your calculations. If you run trains faster you don't need as many of them.*

A51a: I agree that the length of time for a journey and the headways are related, but if a train runs faster and gets to Union Station earlier, it still needs to wait until its scheduled departure time.

Q52a: *Will the Metrolinx operating plan be effective?*

A52a: The reference case was not meant to be an operating plan. The purpose of the reference case was to provide a reasonable point in time to compare the different options for electrification.

Q53a: *Is the ARL also included in the implementation strategy?*

A53: The ARL is absolutely included in everything we've done. It doesn't take up a station platform at Union, but operationally it has been included in the plan. I understand your frustration that there are a number of operating plans out there. We are not fine tuning an operating plan for GO Transit, but we realize there efficiencies that can be achieved. If there are flows in the logic we want to identify them. We don't want to miss something that will fundamentally change the outcome of the study.

Q54a: *If you have fewer trains, it affects all of the other costs in the study. The constraints at Union Station affect how many trains can operate in an hour, but the speed affects the fleet size. That isn't been accounted for.*

A54a: We will take note of your comment and if we need to modify or adjust, we will do that.

Q55a: *As time goes on and stations are added, the benefits in increased travel time have been missed. They're included in Caltrain study, but not in this one.*

A55a: We have a section where we will talk about the many benefits that could be achieved as the system grows and evolves over time. Please pass your thoughts along that relate to this so we can add it into our report. We're trying to describe something that is achievable, but we would like to address some of the other elements as discussion points for consideration.

Q56a: *Shouldn't the costs of additional stations be put into the comparison?*

A56a: It's an additional cost that would work against the EMU. We're trying to make appropriate comparisons.

Q57a: *Exclusively looking at the short term you will need to consider the additional costs of EMUs that would result because you would need to replace the fleet and discard the other coaches. There is no EMU compatible with existing rolling stock. You will need to consider the political context to understand if such an overhaul in rolling stock might actually be feasible.*

A57a: The assumption is that there is no compatibility between the existing rolling stock and EMUs. Your comments are valid, but need to put it into an appropriate time frame. If you start considering much longer time frames, it gets more expensive and more difficult to achieve.

Q58a: *What are the raw numbers of particulates and NOx that will be emitted by the vehicles? You only give percentages.*

A58a: We have those figures, but these numbers were given for the purpose of this presentation. The numbers will be provided when the report is published.

Q59a: *Wouldn't it be productive to have these conversations with the health authorities during this process?*

A59a: The Study Team has talked to health officials to make certain they understand our methodology and agree with our approach.

Q60a: *(In reference to Environment and Health indicators) What about 5 metres from the track, not 50 metres from the track? Are you over the WHO levels? I'm concerned about the assumption that we don't have to worry about emission levels closer than 50 metres to the track.*

A60a: We can find that out. It's not a matter of not taking it into account; it's a matter of how we've presented the data.

Q61a: *Are there days when the NO_x levels are so close to the emission threshold that the additional trains will push it beyond the threshold? As an example, communities would experience 30 smog alerts per year rather than 4 smog alerts per year.*

A61a: There are nine monitoring stations, and the ones presented are the ones closest to downtown. For everywhere else we've taken an average.

C62a: *If you take the impact of the trains as the width of the corridor, then Georgetown is the best option for electrification. However, the Premier has said that the Lakeshore will be first.*

A62a: The Study Team has not been told of any decision has been made.

C63a: *At first I thought this was all window dressing, but I feel that the Study Team has done a great job. You've told us what is achievable. In the end it will wind up being a political decision. But I am seeing a lot of information presented as being pro-electrification*

APPENDIX C: Sample Worksheet

GO Transit Electrification Study
Stakeholder Workshop #4

WORKSHEET

Please Print

Name (optional)

Email (optional)

Phone Number (optional)

1. *What feedback do you have on the detailed assessment and key preliminary findings?*

2. *What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?*

3. *Do you have any additional comments or questions regarding the GO Transit Electrification Study?*

For further information about this project, please contact:

Karen Pitre
Project Director
Electrification Study
Karen.Pitre@metrolinx.com
416- 874-5910

APPENDIX D: Submitted Individual Worksheets

*** *Notes:**

- **Personal information submitted on worksheets was removed**
- **Where questions are missing no response was given**

Individual Worksheet 1

1. What feedback do you have on the detailed assessment and key preliminary findings?

- We should not put a deadline on construction (i.e. Pan Am Games)
- I do not see a net benefit to the public of this project.
- We are only moving the problem of pollution into someone else's backyard.
- We need to take cars off the road – electrifying the Go train will not accomplish this.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

- I am fine with this. Please do not make an "artificial" deadline of 2015.

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?

- We should be focusing on taking cars off the roads. I do not believe electrification will do this.

Individual Worksheet 2

1. What feedback do you have on the detailed assessment and key preliminary findings?

- You have not accounted for the cost of converting to Tier 4 from Tier 2, such that it becomes a clear comparison of converting to Electric from today's Tier 2.
- Noise factors of locos appear to be averaged out against noise of cars. What is the comparative just for the loco's as they pass the listener?
- Georgetown line currently on part day service. It makes more sense to electrify now according to Roger's analysis of the difficulty and complexities requiring shutting down rail services while key work occurs.
- Lakeshore study schedule demonstrates it takes under 40 months to go from design to operation including track elements and infrastructure rework. This work is already underway on GSSE, so why would electrifying ARL/Union to Pearson take so much longer if it is a shorter route? Vehicle selection is known, transformer location is known. (Willowbrooke areas), MSF will be needed regardless. This should be able to be integrated with GSSE with effective project management, dovetail on the prep work and get it done in time.
- Energy costs of diesel greatly understated. World Energy Congress identified exponential risk starting as of 2015 as current oil supplies are tapped out. As of 2015, price becomes dependant on oil yet to be discovered and hardest to reach deposits.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

- Implementation Planning dates should be stated
- UPRL is already ahead of the game with prep work. Design contract not yet specified for the spur – extend this design work to over all the way to Union.
- UPRL can be a first leg for Lakeshore West out to WIllowbrooke, and a first let out to Brampton.

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?

- There has been NO consideration given to the health risk associated with Tier 4 technology beyond the modelling concentrated emissions and the micro fine particulate that still gets past. Beyond existing standards, what are the concerns that health science tells us are there?
- The risk factors of populations closest to the tracks is highest, there is a socio-economic equity issue here

as enviro stress being added to their health burden.
- WHY HAS HEALTH DEPT NOT RECIEVED YOUR BACKGROUND STUDY FOR REVIEW?
- Is the visual on the thickness of the catenary lines as shown in the video accurate? The distortion makes the wires appear thicker than they will be.
- Cost of conversion of ARL Diesel to Electric should be clearly identified. Timing for this conversion should be clearly identified. Additional stations will add ridership.

Individual Worksheet 3

1. What feedback do you have on the detailed assessment and key preliminary findings?
- Not enough costing (capital) figures presented for what is supposed to...

Individual Worksheet 4

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?
- TOO SLOW!

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?
- Result predetermined by artificial PA-G Dead Line.

Individual Worksheet 5

1. What feedback do you have on the detailed assessment and key preliminary findings?
- Large areas of statistical analysis entirely missing:
  1. Fine particulate matter and its affects are unknown, yet is a burgeoning area of concern internationally in relation to WHO guidelines (Reference: Dr. Murray Millemln, Harvard)
  This is a major omission from air quality E.A. and is being currently being studies, so can be included.
  2. Minimal qualitative analysis or precautionary measures to protect quality of life in neighbourhoods, particularly noise, vibration and imposition of 5.5 metre, 10 km, Wall
  3. The nuisance of diesel trains is much higher through neighbourhoods. This has nto been assessed or considered. By qualitative assessment of urban planning the projects – travel and see difference between electric and diesel.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?
- User-centered design is imperative. This should serve communities first. Greater consideration for residents along the corridor needs to be incorporated into this study and project implementation from the beginning.
- The impact of the noise and vibration on the immediate surrounding community cannot be underestimated – the built environment directly borders this rail corridor, often within meters, and is continuing to be built up. Note the area around Wallace, Sorluren Lofts, and parks: Macgregor, Sorluren, and West Toronto Collegiate.

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?
- There are false premises derived from information missing on fine PM 1.0 and lower, and the affect on west-end residents. If these concerns were included, it would be clear that diesel trains, and the subsequent phasing in of electric, would be unacceptable, and that EMUs for the ARL would be mandatory. These issues were flagged in the first workshop, and not included by the fourth.
- At least half of this $4 M study should have been on consulting for best international practices for electrification.

Individual Worksheet 6

1. What feedback do you have on the detailed assessment and key preliminary findings?

- Why is there no consideration of negative visual impact until the EA process?
- Why was third rail option eliminated?

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?

- Localized air quality impacts should receive more attention.

Individual Worksheet 7

1. What feedback do you have on the detailed assessment and key preliminary findings?

- A large contingent of experienced, competent analysts have put a great deal of work into a heavily documented piece of analysis with no clear conclusion and action plan in view.
- This is not the fault of anyone working on the assignment. It is the fault of the political process, and of [], the lack of long-term funding []. A provincial election is 11 months away, and it seems all too likely that the Liberal party will be [] out or marginalized. (The same is likely at the federal level, and we are seeing the initial effects of a similar disaster at the municipal level). Therefore, this – and other working initiatives could well be headed (again) to oblivion.
- This (or something very similar) has been under the auspices of different governments, over the past 15-plus years. Millions have been spent with no end it sight. The PROCESS is still political and ineffective. Politics always prevails; common sense be dammed.
- Sorry to be so sour. I've been around too long and have been disappointed too often.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

- Start doing it NOW, ARL/Georgetown first.
- ARL should operate as part of the rapid transit SUC, with 3 or 4 stations, and with premium fare (2x? 3x?) to airport. I for one don't see what tracks it runs on.
- Nearly every airport SUC. I've seen/read of/used operates like this – Sydney, Athens, London, etc. Etc.

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?

- I've said enough. More than enough.

Individual Worksheet 8

1. What feedback do you have on the detailed assessment and key preliminary findings?

- It is still unclear where the determinations of rail volumes comes from. No published report or study contains those volumes, yet they are being presented as fact.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

- I still believe the study is skewed away from implementation of the Georgetown corridor first, through doubling the volumes of GO trains on the Lakeshore Corridor relative to Georgetown, based on an unknown or unpublished work plan from GO for 2020. All Metrolinx and GO implementation plans so far publicised (GO 2020 and The Big Move), show Georgetown and Lakeshore lines having similar levels of GO service in 2020, while the ARL would be an additional burden to the Georgetown line. I also believe the study should evaluate implementations of electrification starting immediately. It appears the study is skewed towards implementations leading only to a 2020 date. There is no reason the implementation of, for example, the ARL service could not start immediately. As there was no discussion of possible implementation strategies at the workshop, I would recommend that another workshop be scheduled very soon to allow for feedback on proposed implementation strategies.

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- I find the key players to be honest brokers of the work. However, I find the details of the study to be somewhat confusing. It is still unclear in the documentation whether the study is looking at short term solutions, as was mandated by the terms of reference, or only medium to long-term solutions, as is evidenced by the 2020 time frame.

Individual Worksheet 9

1. What feedback do you have on the detailed assessment and key preliminary findings?

- The premise in the Reference Case is that GO has planned many improvements, notably in GO2020, that will be required whether electrification is implemented or not. Therefore the cost of these should not be charged to electrification per se. So far, so good.

  What we do not have, however, is an estimate of the cost and phasing of getting to that reference case. While this is outside of the scope of your study, it is not outside of the wider context in which the study occurs, namely the limited funding for transit generally, and the competing demands for whatever will flow from the Metrolinx Investment Strategy.

  Indeed, it is unclear to what degree the GO2020 work (and other rail improvements) are funded out of money that was funnelled into GO directly before the Metrolinx amalgamation as opposed to money that will have to appear in future Metrolinx budgets. Put another way, if The Big Move is $50b (for the sake of argument), how much more is required to roll GO2020 into TBM, and is that level of spending actually "committed"?

  With respect to electrification, let us assume for the sake of argument that GO2020 will cost $10b in new money (plus ongoing operating costs). If electrification is another $10b or more on top of this, then it is a substantial added cost. If, however, it is only, say, $3b as a marginal cost, then we are in a range where discussions about tradeoffs, future operating savings, and other benefits of electrification need thorough airing.

  Because we don't know the magnitude or possible timing of either of these, we are left with pronouncements from senior Metrolinx folks that the sky is in imminent danger of crashing down on Toronto if we even say the word "electrification" much less actually do anything about it. Such statements were irresponsible, and went directly contrary to the purpose of the study, namely to

determine the economics of electrification. Prejudging the outcome is hardly a way to imply objectivity.

Next comes the question of service levels and demand estimates. There are at least four different service levels implied by various plans:

- GO2020
- The Reference Case (which does not explicitly list service levels, although I expect these will show up in the detailed operational studies)
- The Big Move 15 year plan
- The Big Move 25 year plan

It is worth noting that TBM's base year is 2008, and so the 15 year plan means 2023, and some may even read it as 2021 if we presume that the base year for projections was 2006.

We know that the Union Station Study, through documents released via another source, thinks that the demand growth will actually be about 3x. The Reference Case gets us to 2.4X, and there was a comment at the recent workshop that the Union Station folks think this is just at the edge of what they can handle. 3X is obviously more than 2.4X, and pushes us into difficult territory.

TBM's demand estimates driven out to the 25 year horizon imply at least 4X growth in peak demand at Union, and the USS is dealing with the implications of such growth. The fact that the USS working papers are not public, unlike those of the electrification study itself, does not encourage confidence, especially when I see the diversity of opinion and options among various participants.

We badly need a definitive number on the capacity of Union Station both as measured by trains/hour and as measured by passenger movements to/from the platforms. An important related issue identified by the Union Station Study is the growth of counterpeak flow, an integral part of GO's future plans, and the effect this will have on vertical links within the station.

Operationally, the ARL presents a challenge through its use of the fence track at Union Station. The spur joins the corridor on the south/west side of the right-of-way, but the fence track is on the north side. This means that all ARL trains must at some point make their way across tracks that will be used by (at least) the Georgetown services. This conflict will place a limitation on the combined headway of both services unless a grade separation is provided somewhere. This has not been addressed by any of the corridor studies.

Metrolinx needs to be much more open about both its various studies and about achieving a consolidated, generally accepted view of its demand projections. One aspect of TBM is the premise that it will divert hordes of motorists onto transit thereby releasing capacity on roads and reducing future pollution growth. If that demand transfer is not actually achieved due to system capacity constraints, then the benefits claimed for TBM will not be achieved, or at least not to the degree advertised.

I find some of the proposals being advanced for capacity relief on the rail system almost laughable. They include a GO subway through downtown as an alternate corridor between Parkdale and Riverdale. Bilevels need a really big tunnel, and of course this would have interesting implications both for line hookups and for transfers between services going to Union and those in the new subway.

Similarly, schemes for using North Toronto Station would split services, and moreover would dump new demand on the Yonge Subway (or the University Line if at Dupont) at the peak point. In general, the idea that there is surplus subway capacity ignores the real world in which the TTC already operates.

Any new underground service, be it on Queen, or somewhere west of Union, will necessarily involve electrification.

One final note about Union Station: In my former role as a member of the City's Public Advisory Group for the Union Station Revitalization, I was told repeatedly in GO presentations that the new trainshed was designed to allow for electrification. This needs to be verified, again, given statements in the electrification workshop implying that this was still a net new cost. Similarly, we need to know the degree to which work already underway to reconfigure the track plant has included provision for future electrification, or if the whole thing has to be dug up again.

Train length (slide 6): There is an ongoing debate about how long trains will be. We know that GO has been expanding to 12-car trains, but the reference case assumes 10-car trains. That's a 1/6 loss of capacity (theoretical, probably less due to uneven car loadings). A related question is the ability of the MP40 Tier 4 locos to pull 12-car trains and their performance, noise and pollution, especially under heavy load uphill. None of the discussions has taken into account problems with the capabilities of these locos as seen already in service, let alone with a Tier 4 retrofit.

Train length is an important part of overall line capacity and of the headways needed to achieve riding estimates. If trains lengths can be longer and/or trains can be pulled faster with electric technologies, then one can achieve higher capacity with fewer trainsets. The 1:1 replacement ratio contemplated by the study misrepresents this important capability.

Moreover, it has been stated that you cannot save trains because of throughput constraints at Union. This is absolute, utter, unmitigated hogwash (I am trying to be polite). The formula for the number of trainsets is quite straightforward.

If the design capacity of a train is C and the peak demand is D/hour, then one needs D/C trains per hour. The bigger C gets (through longer trains or bigger cars), the fewer trains one needs per hour.

The number of trains to serve a route is equal to the round trip time divided by the headway. This assumes a uniform headway over the entire route which, on GO, is unlikely because of the highly directional nature of the demand. However, the same consideration applies even to a unidirectional service. If the trip is T minutes long, and the trains run every H minutes, then you need T/H trainsets. Anything that reduces T such as the ability to make the trip faster also reduces the total number of trains.

The total train complement affects staffing because each train needs enginemen and on-board crew. If you need fewer trains, you need less staff to run them. Moreover, you also need less yard space and have lower maintenance costs.

Any study that compares technologies on a 1:1 basis omits all of the savings available through faster operation. This biases the results by overstating capital requirements for equipment and by overstating future operating costs thereby reducing savings that might otherwise be used to offset higher capital costs.

Rolling Stock Alternatives (slides 9 & 10): I hope that the sanity of rejecting hypothetical technologies such as hydrogen trains actually survives into the final report. Ontario has a long history of being far more interested in whiz-bang technology development as an "industrial strategy" than on providing the best technology and service.

Power Supply (slide 11): At the workshop, it was stated that the power requirement for GO represented a tiny fraction of provincial demand. For better context, this should be stated relative to the portion of the grid to which the electrification would apply. Available power in Thunder Bay is not much use to us in Toronto.

High Level Evaluation (slide 14): I have already commented on 10-car trains and the degree to which this may skew your results. Either you should produce a 12-car evaluation, or you should make a definitive statement about why such trains would not be used (despite them already being in service).

I do not agree with the premise that an entire corridor should be electrified from day 1. You yourself already accept that this will not occur for the Hamilton/Hunter and St. Catharines services. SImilarly, there is no reason to burden the Georgetown corridor with electrification all the way to KW (and beyond to the storage yard) for a few peak-only trains. This is a basic question of staging.

Indeed at the workshop, there was discussion of electrifying only to Bramalea as a major turnback point in service on GO. You need to clarify the difference between the long term economics of full electrification in a corridor versus the short term considerations of a staged implementation.

Reference Case and Staging Options (slides 15-27): I come back here to the question of service levels. There are very significant differences between the scenarios contemplated in TBM (notably "Express Rail") and in GO2020 and, probably, the Reference Case. These need to be reconciled and explicitly stated so that corridor-specific calculations show the effect of various service levels on costs, infrastructure, fleets, yards, etc. Put another way, how does the infrastructure investment trade off against service levels? This is a generic question, although obviously there are special cases where heroic efforts are needed to electrify for the first train.

Environment and Health (slides 28-52): The presentation of emissions for GO as a fraction of the GTHA are on the verge of misleading. This is a not a question of inaccuracy, but of context. The people who will be affected are those living beside the corridors, not an average smeared over the entire GTHA, nor on a 24-hour average.

I live right beside the DVP and I know that the noise and pollution I have to put up with is considerably different than at a quiet house in North Toronto. I choose to live here, and came after the DVP was built. Residents along rail corridors are not in the same position considering that many of the tracks needed to carry increased GO service don't even exist yet.

As mentioned earlier, the noise and (probably) emissions for MP40s is much more pronounced under load (hills, longer trains). This should be factored into the calculations. Note that higher noise levels may cause presumed "indistinguishable from background" conditions to no longer be valid.

User Benefits (slides 53-56): Hmmm. Here we have those pesky 12-car trains again. You cannot selectively use them, or not, as it suits your purpose.

You show a time saving of 16-17 minutes for trips between Hamilton and Union for EMUs. That's a half hour or better for the round trip. Since the headway on this service will easily be less than the time saving, there will be a corresponding saving of equipment. Even for the loco hauled service, the round trip saving is over 10 minutes, and this will save at least one train. Failure to include these savings in your fleet calculations, yard space, train manpower and operating costs will invalidate your conclusions.

As a personal editorial, I have been dealing with this kind of oversight in studies going back to comparisons of diesel buses and streetcars or trolley coaches on the TTC where the same sort of blatant bias was common. Maybe not bias, but if not, then a profound lack of professional accuracy, to put it delicately.

On a related note, it would be worth being explicit about the constraints that prevent better improvements from being attained on some lines. However, the biggest savings are also on the lines with the most projected service, generally, except for Richmond Hill. A round trip saving of 30 minutes is not

to be sneezed at, especially on a 10 minute headway.

By the way, the statement that electric locos produce savings of 7-9% don't square with the claimed time savings. If you save 11 minutes outbound to KW (the largest of the savings, and understandable as it's uphill all the way), and this is, say, 8% of the total, then the one-way trip is about 2 hours and 20 minutes by diesel. Via gets all the way to Stratford in less time than this.

For clarity and accuracy, not to mention honesty, you need to show for each corridor the time taken by a diesel train, the time taken by an electric loc train, and the time taken by an EMU train. I think you will find the percentages are not as low as you claim they are.

Oh yes, one more thing. It is claimed that the constraint on time savings lies with the physical nature of the lines. If this were so, then there should be not much difference between locos and EMUs because the latter would labour within the constraints of the corridor. However, you show a considerably better performance for EMUs on Barrie than with locos. Obviously the EMUs are able to run faster than the locos. Why?

The degree to which you invent explanations for the constraints on electric operation are in contrast to the actual numbers you present. You don't seem to be able to keep your stories straight and this undermines your credibility.

Costing methodology: As previously noted, the number of trains is a function of service levels, round trip times and speeds. You have not taken this into account in your generic projections, and unless this is corrected, neither your capital nor operating costs will be credible.

2. What are your thoughts on the phasing and implementation of electrification on the GO rail network going forward?

- Given the service levels, it is evident that the Lakeshore and Georgetown corridors are the prime candidates for electrification. The phasing needs to be determined in conjunction with service improvements planned but not yet in operation, especially on Georgetown, where there will be a significantly better service from Bramalea east to Toronto.

  It is absolutely essential that the infrastructure contract for the ARL spur provide electrification-ready structures including whatever is needed for overhead catenary, power supply, signaling, grounding, etc. If this is not built into the spur from day 1, there will be a tiny problem with credibility.

  Full electrification of Lakeshore is not a pre-req to doing Bramalea first. At the workshop it was stated that only two tracks would be needed between Union and Willowbrook for service moves.

  Conversely, if Lakeshore is done earlier, then the question becomes the future use of Willowbrook and the proposed new east maintenance facility. Given that Willowbrook is closer to Union and on the west side of the network, and that more potential electric territory lies to the west, it would make sense for Willowbrook to be the electric depot.

3. Do you have any additional comments or questions regarding the GO Transit Electrification Study?

- *You have tried harder than most to produce a fair and detailed study, notwithstanding my caveats above. The biggest problem is that this study is taking place more or less in public while related studies are not, and there will be inevitable inconsistencies thanks to the lack of a consolidated view. How all this will be digested and integrated in a manner that the Metrolinx Board can handle, let alone feed into the 2011 budget cycle and the coming election, is a mystery to me. It's quite a challenge for everyone, and the amount of detail may prevent proper understanding.*

Individual Worksheet 10

1. What feedback do you have on the detailed assessment and key preliminary findings?

- I started out with the idea of giving you my detailed appraisal of the last workshop. Why bother? The decision on electrification was made long ago at the political level and anything that comes from this study won't influence its pre-determined outcome.

  My only concern about the study team is that you've contantly tailored the findings to fit the audience. Even when you present well-research arguments clearly in favour of electrification, you find ways to throw cold water on them. It's as if you're constantly second-guessing your own research because someone is looking over your shoulder.

  Personally, I'm past the point of being irked by not receiving answers to questions I raise in the workshop sessions. It's like whistling into the wind.

  At best, this exercise has merely updated data that has been available for decades. That's not new. Each GO study conducted since the first in 1980 only reploughed the same findings and reached the same conclusion: electric traction is superior to diesel.

  At worst, this current study process is a another indictment of the current government and the unstoppable bureaucracy that inhabits our public agencies.

  Any additional and factual data I could contribute from my 32-year professional involvement in the real world of railroading would be superfluous. I say all of this with no animosity directed at the study team. You're only doing a tough job in a politically-charged environment. I don't envy you.

APPENDIX E: Workshop Invitation and Attendance List

GO Transit Electrification Study
Stakeholder Workshop #4 Invitation and Attendance List
Wednesday, December 1, 2010

* Bolded Organizations Attended Stakeholder Workshop #4

Environment & Health

Pollution Probe
Air and Waste Management Association
Toronto Board of Health
CommunityAIR
Ontario Agency for Health Protection and Promotion
Clinton Climate Initiative
Environmental Health Association of Ontario
ESEI Solar Foundation
Clean Air Partnership
Rouge Park Alliance
Ontario Healthy Communities Coalition
Ontario Clean Air Alliance
Wellesley Institute
Pembina Institute
Ontario Lung Association
Evergreen
Green Communities Canada
Canadian Association of Physicians for the Environment
Conservation Council of Ontario
Friends of the Greenbelt Association
Ontario Public Health Association
Protect Our Water and Environmental Resources
Toronto Public Health

Community

Toronto City Summit Alliance
Weston Village Residents' Association
Weston Community Coalition
Mount Dennis Community Association
Canadian Federation of Students (Ontario)
Unionville Ratepayers Association
Lakeview Ratepayers Association
Metroland Media Group
Member of GO Transit Community Advisory Committee
Centre for Social Innovation
Active Living Alliance for Canadians with a Disability
Center for Information and Community Services of Ontario
Community Living Ontario
Housing Action Now
Ontario Community Support Association
Ontario Council of Agencies Serving Immigrants
Safe Kids Canada
Ontario Heritage
Metrolinx Seniors Advisory Committee
Ontario Undergraduate Student Alliance

Land Use and Social Planning

People Plan Toronto

Sustainable Urban Development Association
Canadian Urban Institute
Ontario Smart Growth Network
Ontario Professional Planners' Institute
pAlliance
Ontario Association of Landscape Architects
Urban Land Institute
Building Industry and Land Development Association
Canadian Policy Research Networks
Ontario Association of Architects
Ontario Federation of Agriculture
Ontario Professional Engineers Association
Neptis Foundation

Transportation Advocacy and Commuter Groups

BA Group
Clean Train Coalition
Regional Transit Advocate
Transit Riders Advocacy Coalition (GTHA)
GO Transit Customer Service Advisory Committee
Healthy Transport Consulting
Canadian Automobile Association (CAA)
Ontario Public Transit Association
Canadian Urban Transit Association
Transport Action Ontario
Smart Commute
Centre for Sustainable Transportation
Ontario Good Roads Association
Disabled and Aged Regional Transit
Canadian Institute of Transportation Engineers

Business and Economic Development

Greater Toronto Airports Authority (GTAA)
FRAM Building Group
The Warren Group
Green Tourism Association
Ontario Agri Business Association
Ontario BIA Association
Ontario Environmental Industry Association
Ontario Restaurant, Hotel, Motel Association
Ontario Tourism & Ontario Tourism Marketing Partnership
Retail Council of Canada
C.D. Howe Institute
The Institute for Competitiveness & Prosperity
BOMA Canada
Ontario Chamber of Commerce
Small Business Association - Canada
Canadian Youth Business Foundation (CYBF)
Toronto Board of Trade
Toronto Association of BIAs
Canadian Federation of Independent Business
Ontario Home Builders Association
Ontario Real Estate Association
Canada Green Building Council, Greater Toronto Chapter

Academic

University of Toronto (2)
McMaster University
Humber College (School of Applied Technology)
Mohawk College of Applied Arts and Technology
Sheridan College Institute of Technology and Advanced Learning
Ryerson University, School of Urban & Regional Planning
Gage Occupational and Environmental Health Unit – University of Toronto
Ontario College of Art & Design
Seneca College of Applied Arts and Technology
University of Ontario Institute of Technology
University of Toronto at Scarborough
York University